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Analyzing the Effects of Intellectual Capital on Market Value and Financial Performance of Companies in the Steel Industry

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ABSTRACT

In today's knowledge-based economy, intellectual capital is a major factor in sustaining competitive advantage of firms. The main purpose of this paper is to examine the impact of intellectual capital and its execution on market value and financial performance of active companies in the steel industry listed in the Tehran Stock Exchange. In this paper the Palick model has been used to measure intellectual capital performance. The time period studied is from 2007 till 2010 and 12 sample companies were chosen. The study has used the Regression Panel Data method (the least squares). The results achieved show that there is a significant relationship between intellectual capital with market value and the financial performance of active companies within the steel industry.

KEY WORDS: Market value, Intellectual capital, Financial performance of companies, Palick model

INTRODUCTION

Intellectual capital is a knowledge-driven process that includes functional testing, organizational technology, customer relationships and professional skills and leads to increase in the competitiveness and of the company and its future profitability. (Eroinson and Malone, 1997)

Ross and colleagues (1997) stated that intellectual capital is the main cause of creating value in companies and also state that companies are moving towards creating value from the existing intellectual assets of the organization. In fact the previous views of managers on creating company value through physical assets have changed. (Ross and colleagues 1997)

Despite the changes that have taken place, existing restrictions in accounting standards and asset rules and regulations made most of the intangible assets in the balance sheet unrecognizable, especially the assets that were produced within the company itself. In late 1980s accounting academics and experts proclaimed their high concern in this field and stated that if accounting regulations and standards cannot devote themselves to the rising need for providing relevant information in investment in intellectual capital, they will lose their relevance in financial reports. A visible effect on the loss and reduction of accounting information relevance is the increasing gap between book value and market value of companies between the 80s and 90s and especially the recent years. The gap between book value and market value cannot be justified only by paying attention to the interest rates and are more related to the failure to identify intellectual capital in the financial statements, especially investing in intangible assets and research and development projects in many developing countries, including the United States, almost doubled around 1953 and 1997, while investment in plant assets did not increase much. (Mar, 2005) Given the importance of knowledge in recent years and while considering the changes in the world of economy and movement from industrial economy towards knowledge-based economy, identification, valuation and management of intellectual capital has become an important and vital matter for companies.

Management must be aware of the amount of the company's intellectual capital in order to manage the company's capital in an optimal way. Users of financial statements should also be aware of the company's intellectual capital in order to predict the company's future and make informed decisions. Therefore identification and proper and correct valuation of intellectual company assets is an important factor for management and users of financial statements, the importance of which increases daily.

In this paper we are trying to analyze the relationship between intellectual capital with market value and the financial performance of active companies in the steel industry.

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History and definitions of intellectual capital

Reform of intellectual capital was first suggested by John Kenneth Galbraith (1969). Galbraith believed that intellectual capital is an ideological process and includes intellectual currents. But Stewart (2001) claims that the issue was mentioned for the first time in 1958 when he and Itami worked together on intellectual capital movements. (In 1980 Itami published a book titled intangible assets) On the whole, the meaning of intellectual capital is more than just intelligence and is associated with a level of mental operations. (Buinsch 1998) based on this definition, intellectual capital is not the only still and intangible asset, it is rather an ideological and dynamic process. David Mar (2004) defines intellectual capital as a set of assets owned by the organization that will increase the value and improve its condition. The common thing among all these definitions of introducing intellectual capital as knowledge are skills a abilities that can lead to the creation of valuable outlets for the company. And sothe intellectual capital is considered as a source of ideas, knowledge, information and intellectual property that can lead to the creation of value and profitability for the company. While considering the different definitions of intellectual capital, most models consider the three subsets, which includes human capital, relational capital (customer) and structural capital (organizational) for the intellectual capital.

Human capital is the value of knowledge, skills, experience and expertise of the employees (Edwinson and Malone, 1997)

Relational capital (customer) is a total of assets that causes a relation with the environment, customers, shareholders, suppliers, products, competitors and the government. Even though the most important part of relational capital is customer relations, it still must not be the only matter considered.

Structural capital (organizational) includes relations and organizational guides and so forth (Edwinson and Malone 1997) Also from Stewart's point of view structural capital includes intellectual assets, metrologies, software's, processes and so forth. Sullivan stated that structural capital includes all the development infrastructures and all the company's tangible assets that also need intellectual assets.

Within all the definitions, a correlation between human capital, structural capital and customer capital can be seen. Most of the research done on intellectual capital is also considered in this classification In fact the correlation between the infrastructures has led them to come together under one title of the organization's intellectual capital

(Brocking 1996, Han 2001, Lee 2001, Ross et al 1997)

The issue's literature or the study's background

Till now many studies have been done on measuring the intellectual capital of companies in different countries, including Bontis's research in Canada (1998) and the research of Bontis and colleagues in Malaysia (2000)showed that there is a positive correlation between the elements of intellectual capital (human, structural, customer) and industry's function. Chen and colleagues (2005) analyzed the relationship between intellectual capital and market value and the financial performance of companies listed in Taiwan Stock Exchange. They used the Palick intellectual capital's increasing value model for as measure for intellectual capital, and by utilizing regression showed that the more the companies' intellectual capital is the better their financial performance and the more market value they will have. With the use of adjusted coefficient intellectual value, Chang (2007) analyzed the effect of intellectual capital on market value (ratio of market value to book value) and profitability (return on assets, return on equity, the strength of simple profitability and profit margins) in Taiwan's information technology industry 2001-2005. The results of the research showed there is a significant and positive relationship between intellectual capital and each of its infrastructures and the company's financial performance.

In Iran, Anvari, Rostami and rostami (2003) have studied various methods and models of measuring intellectual capital. In another study Anvari, Rostami and Saraji (1385) began analyzing the relationship between intellectual capital and market value of shares of companies listed in the Tehran Stock Exchange. The results of the study showed that intellectual capital or market value of shares has a high correlation. Hemmati and Mehrabi (2010) began analyzing the relationship between intellectual capital and the financial return of companies listed in the Tehran Stock Exchange around 2004 till 2008. The results of the study showed that there is a significant and positive relationship between intellectual capital and national return of companies.

Method of study

This is a descriptive and targeted, practical research study. The target of this study is to analyze and present an appropriate method for measuring intellectual capital of companies and to study the relation between intellectual capital with market value and the financial performance of active companies active in the steel industry, listed in the Tehran Stock Exchange.

Hypotheses of the study

The hypotheses of the study consist of main and sub hypotheses

Main hypotheses:

1- There is a significant relationship between intellectual capital and the ratio of market value and book value.

2- There is a significant relationship between intellectual capital and financial performance of companies.

Sub-hypotheses

1- There is a significant relationship between intellectual capital and the company's return on assets (ROA)

2- There is a significant relationship between intellectual capital and the company's main profitability indicators (BEP)

In general, to test the hypotheses of relationship between intellectual capital and financial performance we shall evaluate the relationship between indicators of company performance (BEP, ROA) and intellectual capital components.

Method of gathering information:

The needed information for this study was gathered by the use of CDs of financial information of companies provided by Tehran Stock Exchange, which includes the annual financial statements and explanatory notes accompanying the financial statements, and also the Tehran Stock Exchange site.

The study's population and statistical sample:

The study's method of sampling is exclusion. In this method all the financial statements of companies listed in the Tehran Stock Exchange (companies active in the steel industry) during 2006 till 2010 were extracted (11 companies), from which while considering the below characteristics, the same 11 companies were identified as eligible.

1- Their financial period would end on 29thEsfand (the last month of the Persian year)

2- Have profitability and operating income during the whole period of the study.

3- Have no changes in the fiscal year during the whole period of the study.

4- Have no trading halts for more than 3 months during the whole period of the study.

5- Have no negative equity during the whole period of the study.

Research model

The coefficient intellectual value added was edited by Palick and the analytical tool for measurement is the company performance The coefficient intellectual value added for measurement depends on the hypotheses that measuring and developing company's added value might affect the company's market value. (pulic, 2000) This method was randomly and practically performed on the of 250 companies, and based on the results achieved, a close relationship was proven between the efficiency of value creation by sources (which is the same coefficient value added intellectual capital) and the value of the market of companies. The coefficient intellectual added value measures the creation of value in companies and them. Human capital efficiency as the ratio of the intellectual added value, describes the company's intellectual capital's efficiency. Method of coefficient intellectual added value is based on the principle that creating value comes from two primary sources of physical capital and intellectual capital resources. In fact this absolute performance ratio measures the creation of value related to all the resources used, while the function of intellectual capital 3 reflects the created value by the intellectual capital used. (pulic, 2004) The coefficient intellectual capital value added has been mentioned in many scientific conferences around the world and many people have used these coefficients in trade. it might be possible to identify the below reasons for the superiority of the Palick model over other models of intellectual capital measurement.

1) Method of coefficient intellectual capital value added is very simple and clear and provides a basis for measurement.
2) This model is evaluated based on both performance and value creation of tangible and intangible assets of the company.
3) The data needed to calculate the intellectual capital in this method can easily be extracted from financial statements of companies, and so the calculations done can be validated and verified.
4) This model has been used in reputable foreign researches and studies.

In the Palick model (200) the added value of the company is the difference between the sales revenue and cost of purchased goods and services.

The cost of purchased goods and services – total income from sales of goods and services = value added (VA)

While considering the existing information in the annual financial statements of companies, value added can be calculated as shown below:

Cost of depreciation + payroll costs for employees + operating profit = value added (VA)

In fact in the Palick model payments for employee payroll is not counted as a cost but rather as an investment. In the Palick model, coefficient intellectual value added has three subdivisions of human capital efficiency, structural capital efficiency and capital efficiency employed.

1) Human capital efficiency (HCE)
This ratio shows the created value added by employees that comes from the division of added value to cost of payroll and costs of employees, and means that for every Rial payment made for payroll and cost of employees how manyRialsis created as added value.
Structural capital is the result of an encounter:

$$HCE = \frac{VA}{HC}$$

$$SC = VA - HC$$

2) Capital efficiency employed (CEE)
This ratio shows the value added that is created from applying physical and tangible assets. Which means for every Rials of asset, how many Rials is created as added value.

$$CEE = \frac{VA}{CE}$$

CE: the employed capital that is equal in value to the book value of the company's total assets, excluding intangible assets.
While considering the above definitions, the coefficient intellectual value is obtained from the following equation.
VAIC=HCE+SCE+CEE
As seen, the relational capital (customer) is not considered in the Palick model.

The study's variables:
The study's variables are divided into two groups of dependant and independent. Changes in the dependant variable are dependent on the independent variable.

Independent variables:
According to the model used and based on the theoretical Palick model, components of intellectual capital are used as independent variables that consist of: capital efficiency employed (CEE), structural capital efficiency (SCE), human capital efficiency (HCE)

Dependent variables:
The dependent variables of this study are the ratio of market value to book value and the financial performance of the aimed companies during the study period, which are presented in the form of profitability ratios. These ratios are ratios that are the purest and clearest measure of corporate performance. Ratios and means of their measurement is explained below
Ratio of market value to company book value – this ratio is used as an indicator for determining the amount of the company's intellectual capital.

$$\frac{\text{company value market}}{\text{company book value}} = \text{ratio of market value to book value}$$

The value of company book value is in fact the difference between the assets and liabilities of the company, or in other words the payroll of shareholders. However much the market value of a company is greater than its book value, is an indication of the existence of intellectual assets that have not been shown in the company's balance sheet although all these differences are not related to the company's intellectual capital, but as most researchers believe the top reason for this difference points to the intellectual capital of the company.
The value of the company's market is equal to multiplying the number of company shares in the price of the stock market.
Return on assets: this ratio indicates the efficient use of assets

$$ROA = \frac{NI}{TA(A)}$$

ROA: return on all assets
NI: net profit
TA (A): average of total assets
The indicators of profitability: this ratio measures and is practically one of the best measuring indicators of the operation.

$$BEP = \frac{OI}{TA(A)}$$

BEP: main profitability indicator
OI: operational profit
TA (A): total asset average

The study's statistical tools and methods:

After extraction of information from the financial statements and annualaudited notes it was processed with the help of version V of E views industrial estimating software and by using the Patel Data method (generalized least squares).

Econometric model specification:

The approach based on panel data regression will be used in order to study the effect of intellectual capital on market value and financial performance of steel industry companies, because while considering the limitations on the use of time-series models in short periods of time much like the statistical limitations and also its integration with various levels, the use of panel data is considered useful. The general types of panel data models are mentioned below:

$$Y_{it} = \alpha + \beta X_{it} + U_{it} \quad (1)$$

In which N…, 2, 1t= shows the sectional units and T…, 2, 1t= points to time. Y_{it} is the dependent variable for i sectional unit during the year t and X_{it}

The benefits of using panel data rather than sectional data and time-series is that in this method the existence of anisotropy variance becomes limited, Bias becomes minimal, the linearity between variables becomes less, on the other hand in such conditions the data is more appropriate for the study of dynamic changes and such data can be studied with more complex behavioral models.

According to theoretical foundations, the empirical studies done on identifying factors affecting the market value and financial performance of companies in the steel industry, intellectual capital variables that include human capital efficiency, structural capital efficiency and capital efficiency employed can be introduced as major effective factors on market value and financial performance of companies in the steel industry in the economic evaluation pattern below:

$$MV_{it} = \alpha_0 + \alpha_1 \mathrm{HCE}_{it} + \alpha_2 \mathrm{SCE}_{it} + \alpha_3 \mathrm{CEE}_{it} + U_{it} \quad i=1,2,...,12 \quad (2)$$

In this pattern MV_{it} is the market value in the company i during t, which in this study consists of the market value ratio to book value MV/NV, asset return ROA_{it} , and the main profitability indicator BEP_{it} . HCE_{it} Human capital efficiency, SCE_{it} structural capital efficiency and CEE_{it} capital efficiency employed in i company during t and finally U_{it} is part of the disturbing pattern.

Studying the experimental results:

The most important issues we face in the use of panel data are reliability of events tests, ability to estimate models for panel data test, determination of fixed or random effects test and estimating parameters. Before estimating the effects of the variables in question on market value and financial performance of companies in the steel industry within the selected companies, it is necessary to test the reliability of all variables used in the estimates, because the unreliability of variables, whether in time-series or panel data, can cause spurious regression problem. But contrary to

what is customary in the case of time-series data, in panel data it is not possible to test the reliability by using the Dickey Fuller and generalized Dickey Fuller (ADF) test, more so it is necessary to test the collective reliability of the variables. In order to do this the Fisher test, specifically for panel data, will be used. Its results for the collective variables model have been shown in chart (1).

Chart (1) Evaluation of reliability of variables based on the Fisher test

Variables	Test statistics	Possibility
Ratio of market value to book value	72/02	0/000
Return on asset	65/39	0/000
Indicators of profitability	76/07	0/000
Human capital performance	164/93	0/000
Structural capital performance	32/09	0/000
Capital efficiency employed	62/13	0/000

Reference: findings

The above chart shows the unit root test results on the variables used in estimating. The null hypothesis in the Fisher test indicates poor reliability variables. Thus if the calculated statistics are greater than the current level of confidence, the null hypothesis based on poor liability will be rejected. The results of chart 1 and the analysis of the amount of calculated statistics and the probability of their acceptance shows that the null hypothesis based on poor liability is rejected, which means all the variable models are reliable. By ensuring of the reliability of the variables, there is no need to test the collectiveness and the fear of being false does not exist any longer, and it is possible to begin estimating the model

Presently we shall examine the ability estimate the model in the form of data panel. First the statistical F Limar has been used in order to choose between data panel method and data fusion method. The null hypothesis of this statistic indicates the selection of data fusion method and its priority to panel data. Considering the reported amount of F in chart (2) the null hypothesis in the pattern related to evaluation of the effect of intellectual capital on the ratio of market value to book value of companies in the steel industry is rejected and so it is possible to use the panel data method for estimating the above pattern, but in the other two patterns, the null hypothesis based on the selection of data fusion method and its priority relative to panel data is no longer rejected and so in order to evaluate these two models the simple linear regression method is used.

Chart (2) Evaluation of the ability to estimate the panel data model based on the F Limar statistics

Model	F test statistics	P statistics
Ratio of market value to book value	F (11,33) =2/11	0/048
Return on assets	F (11,33) =1/52	0/173
Indicators of profitability	F (11,117) =1/57	0/154

Reference: findings

After ensuring the model estimates related to the evaluation of the effect of intellectual capital on the ratio of market value to book value of companies in the steel industry as panel data, the most important question is that are the sectional effects fixed effects or random? On the whole, there are two methods to estimate panel data models: the fixed effects method and random effects. To determine which of these two methods should be used in a sample of the data has its own specific tests. One of the most common of these tests is the Houseman that includes the chi-square (χ^2) statistic, the null hypothesis of which indicates that the existence of random effects in the model is verified. Considering the Houseman test results in chart (3), the null hypothesis is rejected at a less than 10% error level, therefore it is necessary that the mentioned model be estimated in the form of fixed effects.

Chart (3) Evaluation of sectional effects based on Houseman test

Model	Houseman test statistic	P Statistics
Ratio of market value to book value	χ^2 (3)=10/47	0/015

Reference: findings

Considering the Houseman test results and the F Limar statistic, the pattern related to the evaluation of the effect of intellectual capital on the ratio of market value to book value of companies have been estimated by using the fixed effects method, the results of which are presented below.

Chart (4) results of the estimated pattern related to the evaluation of the effect of intellectual capital variables on the ratio of market value to book value of companies in the steel industry

Independent variables	Coefficient	P statistics
Human capital efficiency	-133/95	0/024
Structural capital efficiency	6/57E-11	0/098
Capital efficiency employed	13/21	0/017
R^2=0/43		

Reference: findings

Based on the coefficiency of all variables and their significance and considering the coefficiency of determining a model, explanatory variables considered in the model have been able to explain approximately 0/43 percent of changes in market value ratio to book value. Based on the estimated results the long term relationship between variables can be expressed as follows:

$MV/NV_{it} = -133/95HCE_{it} + 6/57E\text{-}11SCE_{it} + 13/21CEE_{it}$ (3)

The estimated results show that in according to theoretical foundations, all the variables in question, except human capital efficiency, have a positive and significant effect on market value ratio to book value in the selected companies during the period in question, this is in such a way that one percent increase in human capital efficiency with an assumption that all other things remain fixed caused 133/95 percent increase in the market value ratio to book value in the selected companies. Also, with the assumption that all other things remain fixed, one percent increase in structural capital efficiency would cause 6/57E-11 percent increase in the market value ratio to book value, one percent increase in capital efficiency employed would cause 13/21 percent increase in the market value ratio to book value in the group of selected companies. The capital efficiency employed variable has the most positive effect in the mentioned model.

Considering the F Limar test results in chart (2), models related to the evaluation of the effect of the intellectual capital variables on the return on asset of companies in the steel industry, and the evaluation of the effect of Intellectual capital variables on the main profitability indicators of companies in the steel industry in the form of a simple linear regression model will be estimated, and can be introduced in the form of the econometric model below:

$$ROA_t = \alpha_0 + \alpha_1 \mathrm{HCE}_t + \alpha_2 \mathrm{SCE}_t + \alpha_3 \mathrm{CEE}_t + U_t \quad t=1,2,3,4 \ (4)$$

$$BEP_t = \alpha_0 + \alpha_1 \mathrm{HCE}_t + \alpha_2 \mathrm{SCE}_t + \alpha_3 \mathrm{CEE}_t + U_t \quad t=1,2,3,4 \ (5)$$

In which ROA is the return on assets, BEP as the main profitability indicators, HCE as human capital efficiency, SCE as structural capital efficiency and CEE as capital efficiency employed during t, and ultimately U_t is a part of the disturbing pattern.

Chart (5) The study of meaningful estimates of the linear regression model

Model	F test statistics	P statistics
Return on assets	F(3,45)=26/6	0/000
Main profitability indicator	F (3,45)=15/95	0/000

Reference: findings

In chart (5) the F statistics related to the simple linear regression model and its meaningful estimates are shown, the results of which indicate significance of regressions performed, which considering the above results, the pattern related to the evaluation of the effect of intellectual capital on return on asset of companies in the steel industry and the pattern related to the evaluation of the effect of intellectual capital on the main profitability indicator of companies in the steel industry have been estimated by using the simple linear regression effects method, the results of which are presented in charts (6) and (7) below.

Chart (6) the results of estimating the pattern related to the evaluation of the effects of intellectual capital variables on return on assets of companies in the steel industry

Independent variables	Coefficient	P statistics
Human capital efficiency	0/061	0/000
Structural capital efficiency	-6/50E-15	0/442
Capital efficiency employed	0/009	0/697
R^2=0/63		

Reference: findings

The results of the pattern related to the evaluation of the effect of intellectual capital variables on return on assets of companies in the steel industry show that between the intellectual capital variables, only the human capital efficiency are effective on return on assets of companies in the steel industry, and this is in such a way that one percent increase in human capital efficiency, while assuming that all else remain the same, would cause 0/061 percent increase in the return on assets of the selected companies.

Chart (7) the results of estimating the pattern related to the evaluation of the effects of intellectual capital variables on the main profitability indicator of companies in the steel industry

Independent variables	Coefficient	P statistics
Human capital efficiency	0/081	0/000
Structural capital efficiency	-1/59E-14	0/259
Capital efficiency employed	0/025	0/540
R^2=0/52		

Reference: findings

Also the results related to the estimation of the pattern related to the evaluation of the effects of intellectual capital variables on the main profitability indicator of the steel industry companies show that between the intellectual capital variables the only effective variable on the main profitability indicator in the steel industry companies is the human capital efficiency, and this is in such a way that one percent increase in human capital efficiency, while assuming that all else remain the same, would cause a 0/081 percent increase in the main profitability indicator of the selected company.

Conclusion

Considering the results of the study, the section related to intellectual capital related to structural capital efficiency and capital efficiency has a significant relationship with the market value ratio to book value and the first hypothesis is confirmed, and the section related to human resources efficiency, it is not possible to judge its significant relationship.

And about the second hypothesis, the part of intellectual capital variable related to human capital efficiency has a significant relationship with return on asset and the main profitability indicator, and the second hypothesis is confirmed, and the section related to structural capital efficiency and capital efficiency employed, it is not possible to judge its significant relationship.

Now it can be said that a significant relationship shows that the use of employees in an investment will increase value added. And so we must value human resources.

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